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10/726,688	12/04/2003	Chun Tai	1110-295	5660

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ROTHWELL, FIGG, ERNST & MANBECK, P.C.  
1425 K STREET, N.W.  
SUITE 800  
WASHINGTON, DC 20005

EXAMINER

CHANG, CHING

ART UNIT	PAPER NUMBER
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3748

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/726,688

Applicant(s)

TAI ET AL.

Examiner

Ching Chang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                                                                 |                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                                            | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/04/2003</u> . | 6) <input type="checkbox"/> Other: ____                                                |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. ***Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.***

More specifically, "said accumulator", "said check valve", and "high-pressure changes in fluid pressure" in claim 12 render the claimed subject matter indefinite.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an

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application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**4. *Claims 1-4 are rejected under 35 U.S.C. 102(e) as being anticipated by Janak (US Patent 6,591,795).***

Janak discloses a valve actuation system for use in an internal combustion engine comprising at least one combustion cylinder having a piston and an engine valve (500), said valve actuation system comprising: a hydraulic pump (200) configured to produce a hydraulic output based on a valve-piston clearance profile (See Fig. 6) of at least one cylinder of said combustion engine, a high-pressure reservoir (210) coupled with said hydraulic pump; and an electro-hydraulic valve actuator (300) coupled with said high-pressure reservoir and configured to actuate at least one engine valve of said combustion engine according to an output of said hydraulic pump; further comprising at least one feedback loop (212) from said electro-hydraulic valve actuator to said high-pressure reservoir, such that when the pressure in said high-pressure reservoir is lower than the pressure in said electro-hydraulic valve actuator, hydraulic fluid travels from said electro-hydraulic valve actuator back to said high-pressure reservoir; wherein said hydraulic pump includes a cam (110) and a plunger (120), said cam having a shape (See Fig. 1) selected to produce said hydraulic output based on said valve-piston clearance profile of said at least one engine cylinder, such that said plunger moves toward said cam when valve-piston clearance of said piston and said engine valve approaches zero; wherein said electro-hydraulic valve actuator includes a control chamber (220) coupled with said high-

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pressure reservoir and at least one plunger (310) fluidly connected with said control chamber and mechanically connected to said at least one engine valve, and said valve actuation.

5. ***Claim 10 is rejected under 35 U.S.C. 102(e) as being anticipated by Janak (US Patent 6,591,795).***

Janak discloses a valve actuation method for use in an internal combustion engine (See Fig. 1) comprising at least one combustion cylinder having a piston and an engine valve (50), said engine comprising an electro-hydraulic valve actuation system (200, 300, 400) for opening and closing said engine valve, said valve actuation system comprising a hydraulic pump (200) including a plunger (120) mechanically coupled with a cam (110), said cam moving said plunger to create hydraulic pressure and being mechanically coupled to an engine crankshaft, said electro-hydraulic valve actuation system also including a second plunger (310) fluidly connected with said hydraulic pump and mechanically connected with said engine valve for opening and closing said engine valve, said method comprising steps of : determining a piston-valve clearance profile (See Fig. 6) of said piston and said engine valve for said at least one combustion cylinder; and selecting a shape (110, 112, 114) of said cam of said hydraulic pump based on said piston-valve clearance profile, such that said plunger moves toward said cam when valve-piston clearance of said piston and said engine valve approaches zero.

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6. ***Claims 13-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Janak (US Patent 6,591,795).***

Janak discloses a valve actuation system for use in an internal combustion engine comprising at least one combustion cylinder having a piston and an engine valve, said valve actuation system comprising: a pump means (200) for producing a hydraulic output based on a valve-piston clearance profile (See Fig. 6) of at least one cylinder of said combustion engine, and a valve actuation means (300, 400) for actuating at least one engine valve of said combustion engine according to an output of said pump means; further comprising feedback means (212, 400) for redirecting hydraulic fluid from said valve actuation means when the engine piston moves close to the engine valve.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. ***Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Janak (as applied to claim 13 above) in view of Hu (US Patent 5,537,976).***

Janak discloses the invention, however, fails to disclose an accumulator means.

The patent to Hu on the other hand, teaches that it is conventional in the hydraulic actuator art, to have utilized an accumulator (22) to store extra hydraulic fluid from hydraulic means (90, 50, 40).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the accumulator as taught by Hu in the Janak device, since the use thereof would provide a more accurately controlled engine valve actuation system.

**9. *Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hu (US Patent 5,537,976) in view of Hackett (US Patent 6,092,495).***

Hu discloses a valve actuation system for use in an internal combustion engine (10) comprising at least one combustion cylinder having a piston and an engine valve (30), said valve actuation system comprising: a hydraulic pump (50, 40) configured to produce a hydraulic output, a high-pressure reservoir (having 50 disposed therein) coupled with said hydraulic pump; and an electro-hydraulic valve actuator (58, 52, 100) coupled with said high-pressure reservoir and configured to actuate at least one engine valve of said combustion engine according to an output of said hydraulic pump; further comprising at least one feedback loop (54) from said electro-hydraulic valve actuator to said high-pressure reservoir, such that when the pressure in said high-pressure reservoir is lower than the pressure in said electro-hydraulic valve actuator, hydraulic fluid

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travels from said electro-hydraulic valve actuator back to said high-pressure reservoir; wherein said hydraulic pump includes a cam (40) and a plunger (50), said cam having a shape (42a, 42b) selected to produce said hydraulic output; wherein said electro-hydraulic valve actuator includes a control chamber (having 58 disposed therein) coupled with said high-pressure reservoir and at least one plunger (58) fluidly connected with said control chamber and mechanically connected to said at least one engine valve, and said valve actuation.

Hu discloses the invention as recited above, however, fails to disclose the said hydraulic output being based on a valve-piston clearance profile.

The patent to Hackett on the other hand, teaches that it is conventional in the engine valve actuation art, to have utilized a valve-piston clearance profile (See Fig. 2), in order to avoid an interference during an engine valve actuation.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized a valve-piston clearance profile as taught by Hackett in the Hu device, since the use thereof would provide an improved engine valve actuator, to avoid an interference between the engine valve and the piston.

**10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hu (US Patent 5,537,976) in view of Hackett (US Patent 6,092,495).**

Hu discloses a valve actuation method for use in an internal combustion engine (10) comprising at least one combustion cylinder having a piston and an engine valve (30), said engine comprising an electro-hydraulic valve actuation



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system (40, 58, 50, 52, 90, 100) for opening and closing said engine valve, said valve actuation system comprising a hydraulic pump (having 50 disposed therein) including a plunger (50) mechanically coupled with a cam (40), said cam moving said plunger to create hydraulic pressure and being mechanically coupled to an engine crankshaft, said electro-hydraulic valve actuation system also including a second plunger (58) fluidly connected with said hydraulic pump and mechanically connected with said engine valve for opening and closing said engine valve, said method comprising steps of : determining a piston-valve clearance profile (See Fig. 6) of said piston and said engine valve for said at least one combustion cylinder; and selecting a shape (42a, 42b) of said cam of said hydraulic pump.

Hu further discloses the said valve actuation system comprising a control chamber (having 58 disposed therein) coupled with a high-pressure reservoir (having 50 disposed therein) via a control valve (52), and the said method comprising a step of: coupling an accumulator (22) with said high-pressure reservoir; and providing a feedback loop (54) from said control chamber to said high-pressure reservoir.

Hu discloses the invention as recited above, however, fails to disclose the said method comprising the step of determining a piston-valve clearance profile.

The patent to Hackett on the other hand, teaches that it is conventional in the engine valve actuation art, to have utilized a valve-piston clearance profile (See Fig. 2), in order to avoid an interference during an engine valve actuation.

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It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized a valve-piston clearance profile as taught by Hackett in the Hu method, since the use thereof would provide an improved engine valve actuation method, to avoid an interference between the engine valve and the piston.

**11. *Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hu (US Patent 5,537,976) in view of Hackett (US Patent 6,092,495).***

Hu discloses a valve actuation system for use in an internal combustion engine comprising at least one combustion cylinder having a piston and an engine valve, said valve actuation system comprising: a pump means (40, 50, 90) for producing a hydraulic output, and a valve actuation means (58, 52, 100) for actuating at least one engine valve of said combustion engine according to an output of said pump means; further comprising feedback means (54) for redirecting hydraulic fluid from said valve actuation means when the engine piston moves close to the engine valve; and further comprising accumulator means (22) for storing excessive hydraulic fluid from the output from said pump means.

Hu discloses the invention as recited above, however, fails to disclose the said hydraulic output being based on a valve-piston clearance profile.

The patent to Hackett on the other hand, teaches that it is conventional in the engine valve actuation art, to have utilized a valve-piston clearance profile (See Fig. 2), in order to avoid an interference during an engine valve actuation.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized a valve-piston clearance profile as taught by Hackett in the Hu device, since the use thereof would provide an improved engine valve actuator, to avoid an interference between the engine valve and the piston.

**12. *Claims 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hu (as applied to claim 4/1 above) in view of Diehl et al. (US Patent 6,321,703).***

Hu further discloses a first feedback loop (54), a second feed back loop having a second control valve (52) and a second check valve (96) disposed therein wherein when said second control valve is open, hydraulic fluid is permitted to flow to low-pressure region (22, 24, 92), and said second check valve allows hydraulic fluid to flow from low-pressure region to said high-pressure reservoir when the pressure in said high-pressure reservoir is below the pressure in said low-pressure region, and an accumulator (22) coupled with said high-pressure reservoir.

Hu discloses the invention as recited above, however, fails to disclose the first feedback loop having a first check valve disposed therein.

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The patent to Diehl on the other hand, teaches that it is conventional in the engine valve control art, to have utilized a check valve (29) configured to allow hydraulic fluid to flow from a control chamber (11) to a high-pressure reservoir (29) when the pressure in said control chamber exceeds the pressure in said high-pressure reservoir.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the check valve as taught by Diehl in the Hu device, since the use thereof would provide an improved engine valve actuation system, to effectively control the hydraulic fluid flowing between a working chamber and a reservoir.

13. ***Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hu in view of Hackett (as applied to claim 10 above), and further in view of Diehl et al. (US Patent 6,321,703).***

The modified Hu method, however, fails to disclose the first feedback loop having a first check valve disposed therein.

The patent to Diehl on the other hand, teaches that it is conventional in the engine valve control art, to have utilized a check valve (29) configured to allow hydraulic fluid to flow from a control chamber (11) to a high-pressure reservoir (29) when the pressure in said control chamber exceeds the pressure in said high-pressure reservoir.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the check valve as taught by Diehl

in the modified Hu method, since the use thereof would provide an improved engine valve actuation method, to effectively control the hydraulic fluid flowing between a working chamber and a reservoir and to avoid an interference between the engine valve and the piston.

### ***Conclusion***

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ching Chang whose telephone number is (703)306-3478. The examiner can normally be reached on M-Th, 7:00 AM -5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Denion can be reached on (703)308-2623. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Patent Examiner

Ching Chang

*Thomas Denion*  
THOMAS DENION  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 3700